



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,480	12/15/2003	Zhigang Qi	10964-065001	3469
26161	7590	12/03/2007	EXAMINER	
FISH & RICHARDSON PC P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022			CHUO, TONY SHENG HSIANG	
			ART UNIT	PAPER NUMBER
			1795	
			MAIL DATE	DELIVERY MODE
			12/03/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,480	QI ET AL.	
	Examiner	Art Unit	
	Tony Chuo	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 and 33-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 and 33-39 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/2/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/2/07 has been entered.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 10/2/07 was filed on 10/2/07. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Response to Amendment

3. Claims 1-23 and 33-39 are currently pending. The amended claims do overcome the previously stated 102 and 103 rejections with the exception of the 102 rejections of claims 1 and 2 as being anticipated by Inoue et al and Mussell et al. However, upon further consideration, claims 1-23 and 33-39 are rejected under the following new 102 and 103 rejections.

Claim Objections

4. Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 does not further limit the subject matter of claim 1 because if R is an alkyl moiety or an alkenyl moiety substituted with halogen as recited in claim 1, R cannot also be a direct bond between the sulfur atom in the sulfonic acid moiety and the fuel cell diffusion layer in claim 2.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1 and 2 are rejected under 35 U.S.C. 102(a) as being anticipated by Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent.

The Inoue reference discloses a fuel cell comprising: a separator provided on an electrode element wherein the electrode element comprises an electrode diffusion layer

and a catalyst layer formed on a polymer electrolyte membrane; and wherein the electrode diffusion layer is a carbon fiber woven fabric (carbon sheet) that has been treated with sulfuric acid so that a sulfonic acid moiety is covalently bonded to the carbon fiber woven fabric (See paragraph [0092] and claims 12 and 14-17).

7. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Mussell et al (US 5882810). The Mussell reference discloses a carbon paper that is oxidized in a medium comprising sulfuric acid in order to increase the wettability of the carbon paper (See column 8, lines 25-29). Examiner's note: A recitation of intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. Since the treated carbon paper taught by Mussell is capable of being used as a fuel cell diffusion layer, it meets the claim.

8. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Colbow et al (US 6153323).

The Colbow reference discloses a carbonaceous substrate (gas diffusion layer) for a liquid feed fuel cell that has been treated with an acidic aqueous solution such as sulfuric acid which introduces acid surface oxide groups (SO_3H) (See column 4, line 34 to column 5, line 20).

9. Claims 1, 5, 6, 10, 11, 13, 18-22, 33-39 are rejected under 35 U.S.C. 102(a) (e) as being anticipated by Menashi (US 2003/0022055).

Regarding claims 1, 18, 19, and 33, the Menashi reference discloses a fuel cell "5" comprising a solid membrane "30" such as Nafion 117, an anode backing layer "14",

and a cathode backing layer "16" (See paragraph [0053]). In addition, it also discloses that the active layer and blocking layer that may be present in gas diffusion electrodes can both include modified carbon products that promotes hydrophilic characteristics by attaching a hydrophilic organic group that has a) a C₁-C₁₂ alkyl group and b) at least one acidic group such as sulfonic acid group (-SO₃H) (See paragraphs [0039],[0040],[0055]). In addition, it also discloses a catalyst layer/Toray paper combination that are both treated with sulfanilic acid to attach -C₆H₄SO₃H to the carbon support (See paragraph [0062]). This further supports the teaching that both the active layer (catalyst layer) and the blocking layer (gas diffusion layer) are treated to include the modified carbon products.

Examiner's note: It is well known in the art that fuel cells comprise anode flow plates and cathode flow plates.

Regarding claims 5, 6, and 34-39, it also discloses a gas diffusion layer that is Toray carbon paper (See paragraph [0058]).

Regarding claim 10, it is inherent that the aqueous permeability of the treated carbon paper is greater than the aqueous permeability of the carbon paper because the treated carbon paper is more hydrophilic than the untreated carbon paper.

Regarding claim 11, the hydrophilic organic group that has a) a C₁-C₁₂ alkyl group and b) at least one acidic group such as sulfonic acid group (-SO₃H) is also a proton conducting material.

Regarding claim 13, it is inherent that the treated gas diffusion layer has an initial contact angle with water of less than about 125° because the treated gas diffusion layer

is hydrophilic.

Regarding claims 20-22, it also discloses using the modified carbon products in direct methanol fuel cells (See paragraph [0054]).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 3, 4, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055) in view of Gyoten et al (WO 99/66578) using (US 6746793) as an equivalent English translation. The Menashi reference is applied to claim 1 for reasons stated above.

However, Menashi does not expressly teach an article wherein R is an alkenyl substituted with fluorine or an alkyl substituted with halogen; or an article that comprises a perfluorinated sulfonic acid. The Gyoten reference discloses a silane compound containing a sulfonic acid group and a fluorine in a part of the linear hydrocarbon chain wherein the silane compound is chemically bonded to a carbon material surface (see column 7, lines 29-32 and column 19, lines 38-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Menashi fuel cell to include an article wherein R is an alkyl substituted with halogen in order to utilize a material that is commonly used in

fuel cell electrodes such as Nafion which is known to be hydrophilic. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Menashi fuel cell to include an article wherein R is an alkyl substituted with halogen because the substitution of a halogen for a hydrogen was held to have been obvious (*Ex parte Dole* 119 USPQ 260 (PO BdPatApp 1957)).

12. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055) in view of Denton et al (EP 0791974). The Menashi reference is applied to claim 1 for reasons stated above.

However, Menashi does not expressly teach a fuel cell diffusion layer comprising a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst. The Denton reference discloses a catalytically active gas diffusion electrode comprising a catalyst that is 40 wt% platinum supported on carbon black (See Example 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi diffusion layer to include a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst in order to provide a gas diffusion electrode with increased dimensional stability and flexibility that can be produced at a lower cost.

13. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055). The Menashi reference is applied to claim 1 for reasons stated above.

However, Menashi does not expressly teach an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than an initial contact angle of water with the diffusion layer.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi fuel cell to include an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than an initial contact angle of water with the diffusion layer because the parameter optimized is recognized in the art to be a result effective variable (In re Boesch, 617 F2d 272, 205 USPQ 215 (CCPA 1980)). The initial contact angle is a result of varying the degree of hydrophilicity of the diffusion layer. In addition, Menashi also teaches controlling the amount of hydrophilic organic groups attached to the carbon product to avoid making a modified carbon product that is overly hydrophilic (See paragraph [0044]).

14. Claim 23 are rejected under 35 U.S.C. 103(a) as being obvious over Menashi (US 2003/0022055) in view of Reddy et al (US 5132193). The Menashi reference is applied to claim 18 for reasons stated above.

However, Menashi does not expressly teach a fuel cell that is a direct propanol fuel cell. The Reddy reference discloses a direct alcohol fuel cell that is a direct feed liquid fuel cell utilizing all C₁-C₅ primary alcohols such as methanol and propanol as the fuel (See column 3, lines 15-21).

Therefore, all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no

change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art at the time of the invention.

Response to Arguments

15. Applicant's arguments with respect to claims 1-23 and 33-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

Application/Control Number:
10/736,480
Art Unit: 1795

Page 10

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC


JONATHAN CREPEAU
PRIMARY EXAMINER